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MECH 320-101: Statics and Mechanics of Materials

Joseph Baladi

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JOHN A. REIF, JR. DEPARTMENT OF
**CIVIL AND ENVIRONMENTAL
 ENGINEERING**



MECH 320-101 Statics and Mechanics of Matls
 Section 101

Fall 2018

Text: Hibbeler, R.C, Statics and Mechanics of Materials, 5th Edition,
 Pearson 2014, ISBN-10: 0-13-345160-7, ISBN-13: 978-0-13-438259-3
 or 10: 0-13-438259-5

Referenced Text: NCEES, Fundamentals of Engineering Supplied-Reference Handbook,
 latest edition, (or reproduce pages from:

http://www.ncees.org/exams/study_materials/fe_handbook/)

Prof. Joseph Baladi, P.E, P.P. Email: joseph.baladi@njit.edu

Instructors: Class 6:00 pm - 9:05 pm W Central King Building 220 Sep 04, 2018 - Dec 21, 2018

Tutoring:

Tutoring will be available, schedule will be emailed to students.

Prerequisites: *Phys 111 and Math 112, For chemical engineering and electrical engineering majors. Statics provides an understanding of the equilibrium of particles and rigid bodies, including simple machines, trusses, and frictional forces. Mechanics of materials covers pressure vessels, thermal stresses, torsion of shafts, stresses and deflection in beams, and column action.*

Week	Topics	Sections, Pages	Homework Problems
1	General Principles, Concurrent Force Systems	1.1 – 1.5, p.3-14 2.1 – 2.4, p.17-36	2- 3, 10, 19, 23, 30, 35
2	Cartesian Vectors, Position Vectors, Dot Product	2.5 – 2.6, p.40-48 2.7 – 2.9, p.52-69	2- 38, 40, 51 & 52, 2- 62, 65, 75
3	Force System Resultants / Moment Systems	3.1 – 3.7, p.79-130	3- 5, 10, 11, 39, 58, 64, 75
4	Equilibrium of Rigid Bodies	4.1 – 4.4, p.157-182	4- 3, 6, 15, 21, 42, 54
5	Quiz #1 Structural Analysis, Method of Joints	5.1 – 5.3, p.223-238	5- 3, 6, 10
6	Structural Analysis, Method of Sections, Frames and Machines, Handout.	5.4, p.239-247 5.5 p.248-265	5- 20, 26, 30 5- 48, 51

7	Center of Gravity, Moment of Inertia	6.1 – 6.2, p.269-291 6.3 – 6.5, p.292-309	6- 21, 36, 37, 41 6- 61, 69, 86, 90
8	Stress and Strain Allowable Stress Design, Deformation	7.1 – 7.5, p.311-345 7.6 – 7.9, p.346-377	7- 5, 11 7- 31, 34
9	Mechanical Properties of Materials Poisson's Ratio	8.1 – 8.4, p.379-394 8.5 – 8.6, p.398-409	8- 1, 7, 13 8- 21, 23
10	Quiz #2 Axial Loading	9.1 – 9.2, p.411-420	9- 2, 3, 19
11	Torsion Angle of Twist	10.1 - 10.3, p.453-468 10.4 p.474-482	10- 6, 9, 14, 34 10- 37
12	Bending, Shear and Moment Diagrams The Flexure Formula, Handout	11.1 – 11.2, p.499-515 1.4 p.529-536	11- 2, 3, 6 11- 73
13	Quiz #3 Stress Transformation, Mohr's Circle	14.1 – 14.3, p.619-635 14.4 p.643-650	14- 3, 6, 11, 15 14- 44, 50
14	Column Buckling	17.1 – 17.3, p.777-790	17- 7, 9, 36
15	Final Exam Week		

Basis of Grading

Homework	10%
Class Participation	5%
Quizzes	60% (20% each)
Final	25%
Total	100%

Grade Distribution

A = 88 to 100
 B+ = 82 to 87
 B = 76 to 81
 C+ = 70 to 75

- C = 65 to 69
- D = 60 to 64
- F = 59 or less
- W = Voluntary before deadline

Incomplete may be given in rare instances when the student is unable to attend or otherwise do the course due to illness etc. All of the missed work must be made up during the following semester.

Policies

Attendance: Attendance will be taken at the beginning of the class.

*The NJIT Honor Code will be upheld and any violations will be brought to the immediate

attention of the Dean of Students.

*Students will be consulted with by the instructor and must agree to any modifications or deviations

from the syllabus throughout the course of the semester.

QUIZZES: All quizzes and finals will be "Closed Book". Only the FE Handbook is permitted as a resource, but NO notes may be added. You should not write in the FE Handbook.

The quizzes will be given approximately at the end of the fourth, eighth and twelfth weeks. Information

regarding the exact dates and the times will be provided by the instructor.

No make-up quizzes will be given. Instead, the weight for the final examination may be proportionately higher to make up the legitimately missed quiz. (Note from a physician, etc).

HOMEWORK: Problems on the course outline sheet are to be solved and submitted at the beginning of the first lecture in the week following the assignment. Homework will be graded and returned to the student during the following week. To obtain full credit, you must submit the work on time and in the proper form. A minimum of 70% of the homework must be submitted to receive a passing grade.

1.	Use 5-square per inch National Computation pad paper <u>ONLY</u> (sold at the NJIT Bookstore). Problems should be done on one side of the 8-1/2 x 11 pad paper.
2.	On the top of each page, in the space provided, Print your instructor's name, section, problem number, student's name (LAST, FIRST) date, and page number.
3.	The problems must be presented in numerical order as assigned, with one problem per page. Letters and numbers must be neat, clear and legible.
4.	Draw neat, clear, free body diagrams as required. Use a straight edge or other drawing instruments as needed.
5.	Box in the final answer accompanied by its units. DO NOT HAND IN CLASS NOTES.

6.	Staple the problems in proper numerical order with a single staple in the upper left-hand corner.
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Additional Note*:

Attendance will be taken at the beginning of the class and could affect your final grade.

In case of any student misses a class / quiz, or fail to submit an assignment on time, the ***Office of the Dean of Students*** is the only entity that would determine the legitimacy of the absence or the situation via a written email addressed to the course instructor.

It is the student's responsibility to contact the office mentioned above and make his/her case with proper documentations.

Please note that your final grade will reflect your work and calculated exactly as indicated in the above breakdown, no extra credits will be given.

Outcomes Course Matrix – MECH 320 Statics and Mechanics of Materials

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Methods/Metrics
Student Learning Outcomes 1: Identify transition concepts from Physics (science) to Engineering Mechanics.			
Present the engineering approach and problem solving techniques.	1	1	Homework and exams
Present approach of going from the equilibrium of particles to that of rigid bodies.	1	1	Homework and exams.
Student Learning Outcomes 2: Formulate, diagram, and solve FBD problems.			
Require FBD's for all problems.	1	1	Homework and exams.
Illustrate the problem solution by formulating the appropriate equation set.	1	1	Homework and exams.
Student Learning Outcomes 3: Analyze the mechanical behavior of materials under various load conditions.			
Present various aspects of stress, strain and deformation relationships and their application to	1	1	Homework and exams.

various engineering problems.			
Provide examples of several analytical methods to determine the mechanical behavior of materials under various load conditions.	1	1, 2	Homework and exams.
Student Learning Outcomes 4: Apply problem solving techniques to real world situations.			
Provide analytical techniques for the types of mechanics problems, which commonly occur in the industries, which employ chemical engineers.	1, 2	1	Homework and exams.
Provide development of structured problem solving techniques for various classes of mechanics problems.	1	1	Homework and exams.

CEE Mission, Program Educational Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program educational objectives are reflected in the achievements of our recent alumni:

1 – Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

2 – Professional Growth: Alumni will advance their skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as business and law through further education.

3 – Service: Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Our Student Outcomes are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of

- public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
 4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
 5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions
 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Revised: 2/13/18